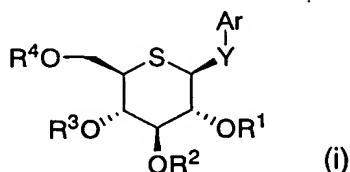


CLAIMS

1. A 5-thio- β -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof or a hydrate thereof:



[wherein

Y represents -O- or -NH-,

10 R^1 , R^2 , R^3 and R^4 , which may be the same or different, each represent a hydrogen atom, a C_{2-10} acyl group, a C_{7-10} aralkyl group, a C_{2-6} alkoxy-carbonyl group, a C_{1-6} alkoxy- C_{2-10} acyl group or a C_{1-6} alkoxy- C_{2-6} alkoxy-carbonyl group,

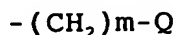
Ar represents an aryl group substituted with -X-A¹,
15 in which the aryl group may further be substituted with the same or different 1 to 4 substituents selected from:

a halogen atom;

a hydroxyl group;

a C_{1-6} alkyl group which may be substituted with 1 to
20 4 substituents selected from the group consisting of a halogen atom and a hydroxyl group;

a group represented by the formula:



{wherein m represents an integer of 0 to 4 and Q

25 represents a formyl group, an amino group, a nitro group,

a cyano group, a carboxyl group, a sulfonic acid group, a C₁₋₆ alkoxy group which may be substituted with 1 to 4 halogen atoms, a C₁₋₆ alkoxy-C₁₋₆ alkoxy group, a C₂₋₁₀ acyloxy group, a C₂₋₁₀ acyl group, a C₂₋₆ alkoxycarbonyl group, a C₁₋₆ alkylthio group, a C₁₋₆ alkylsulfinyl group, a C₁₋₆ alkylsulfonyl group, -NHC(=O)H, a C₂₋₁₀ acylamino group, a C₁₋₆ alkylsulfonylamino group, a C₁₋₆ alkylamino group, an N,N-di(C₁₋₆ alkyl)amino group, a carbamoyl group, an N-(C₁₋₆ alkyl)aminocarbonyl group, or an N,N-di(C₁₋₆ alkyl)aminocarbonyl group}; or

a C₃₋₇ cycloalkyl group, a C₃₋₇ cycloalkyloxy group, an aryl group, a C₇₋₁₀ aralkyl group, an aryloxy group, a C₇₋₁₀ aralkyloxy group, a C₇₋₁₀ aralkylamino group, a heteroaryl group, or a 4- to 6-membered heterocycloalkyl group, provided that each of these groups may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a C₁₋₆ alkyl group and a C₁₋₆ alkoxy group,

X represents -(CH₂)_n-, -CO(CH₂)_n-, -CH(OH)(CH₂)_n-, -O-(CH₂)_n-, -CONH(CH₂)_n-, -NHCO(CH₂)_n- (wherein n represents an integer of 0 to 3), -COCH=CH-, -S- or -NH-, and

A¹ represents an aryl group, a heteroaryl group or a 4- to 6-membered heterocycloalkyl group, each of which may be substituted with the same or different 1 to 4 substituents selected from:

a halogen atom;

a hydroxyl group;

a C₁₋₆ alkyl group which may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom and a hydroxyl group;

a group represented by the formula:

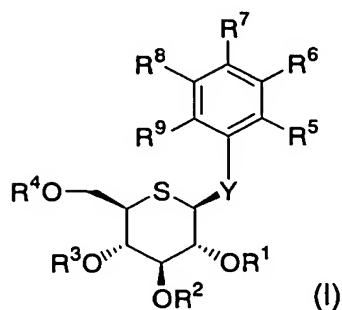


{wherein m' represents an integer of 0 to 4 and Q' represents a formyl group, an amino group, a nitro group, a cyano group, a carboxyl group, a sulfonic acid group, a C₁₋₆ alkoxy group which may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom and a hydroxyl group, a C₁₋₆ alkoxy-C₁₋₆ alkoxy group, a C₂₋₁₀ acyloxy group, a C₂₋₁₀ acyl group, a C₂₋₆ alkoxycarbonyl group, a C₁₋₆ alkylthio group, a C₁₋₆ alkylsulfinyl group, a C₁₋₆ alkylsulfonyl group, -NHC(=O)H, 10 a C₂₋₁₀ acylamino group, a C₁₋₆ alkylsulfonylamino group, a C₁₋₆ alkylamino group, an N,N-di(C₁₋₆ alkyl)amino group, a carbamoyl group, an N-(C₁₋₆ alkyl)aminocarbonyl group, or an N,N-di(C₁₋₆ alkyl)aminocarbonyl group}; or

a C₃₋₇ cycloalkyl group, a C₃₋₇ cycloalkyloxy group, 20 an aryl group, a C₇₋₁₀ aralkyl group, an aryloxy group, a C₇₋₁₀ aralkyloxy group, a C₇₋₁₀ aralkylamino group, a heteroaryl group, or a 4- to 6-membered heterocycloalkyl group, provided that each of these groups may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a 25 C₁₋₆ alkyl group and a C₁₋₆ alkoxy group].

2. A 5-thio-β-D-glucopyranoside compound of the

following formula or a pharmaceutically acceptable salt thereof or a hydrate thereof:



5 [wherein

Y represents -O- or -NH-,

R¹, R², R³ and R⁴, which may be the same or different, each represent a hydrogen atom, a C₂₋₁₀ acyl group, a C₇₋₁₀ aralkyl group, a C₂₋₆ alkoxy carbonyl group, a C₁₋₆ alkoxy-C₂₋₁₀ acyl group or a C₁₋₆ alkoxy-C₂₋₆ alkoxy carbonyl group, and
 10 at least one of R⁵, R⁶, R⁷, R⁸ and R⁹ represents -X-A¹ (wherein X and A¹ are as defined in claim 1) and the other, which may be the same or different, each represent:

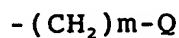
a hydrogen atom;

15 a halogen atom;

a hydroxyl group;

a C₁₋₆ alkyl group which may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom and a hydroxyl group;

20 a group represented by the formula:



(wherein m and Q are as defined in claim 1); or

a C₃₋₇ cycloalkyl group, a C₃₋₇ cycloalkyloxy group,

an aryl group, a C₇₋₁₀ aralkyl group, an aryloxy group, a C₇₋₁₀ aralkyloxy group, a C₇₋₁₀ aralkylamino group, a heteroaryl group, or a 4- to 6-membered heterocycloalkyl group, provided that each of these groups may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a C₁₋₆ alkyl group and a C₁₋₆ alkoxy group].

3. The 5-thio- β -D-glucopyranoside compound according to claim 2, wherein Y is -O-, or a pharmaceutically acceptable salt thereof or a hydrate thereof.

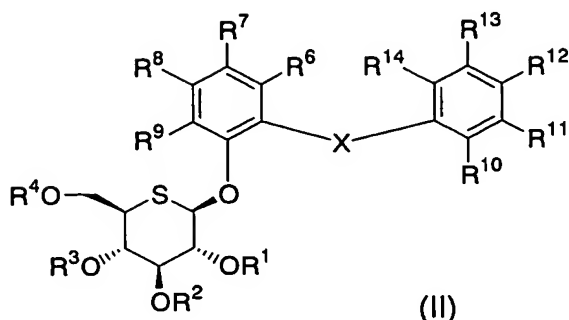
4. The 5-thio- β -D-glucopyranoside compound according to claim 2 or 3, wherein R⁵ is -X-A¹, or a pharmaceutically acceptable salt thereof or a hydrate thereof.

5. The 5-thio- β -D-glucopyranoside compound according to claim 4, wherein X is -(CH₂)_n- (wherein n represents an integer of 0 to 3), or a pharmaceutically acceptable salt thereof or a hydrate thereof.

6. The 5-thio- β -D-glucopyranoside compound according to claim 4, wherein X is -CO(CH₂)_n- (wherein n represents an integer of 0 to 3), or a pharmaceutically acceptable salt thereof or a hydrate thereof.

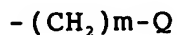
7. A 5-thio- β -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt

thereof or a hydrate thereof:



[wherein

- 5 X represents $-(CH_2)_n-$, $-CO(CH_2)_n-$, $-CH(OH)(CH_2)_n-$,
 $-O-(CH_2)_n-$, $-CONH(CH_2)_n-$, $-NHCO(CH_2)_n-$ (wherein n
represents an integer of 0 to 3), $-COCH=CH-$, $-S-$ or $-NH-$,
 R^1 , R^2 , R^3 and R^4 , which may be the same or different,
each represent a hydrogen atom, a C_{2-10} acyl group, a C_{7-10}
10 aralkyl group, a C_{2-6} alkoxy carbonyl group, a C_{1-6} alkoxy-
 C_{2-10} acyl group or a C_{1-6} alkoxy- C_{2-6} alkoxy carbonyl group,
 R^6 , R^7 , R^8 and R^9 , which may be the same or different,
each represent:
a hydrogen atom;
15 a halogen atom;
a hydroxyl group;
a C_{1-6} alkyl group which may be substituted with 1 to
4 substituents selected from the group consisting of a
halogen atom and a hydroxyl group;
20 a group represented by the formula:



{wherein m represents an integer of 0 to 4 and Q

represents a formyl group, an amino group, a nitro group,
a cyano group, a carboxyl group, a sulfonic acid group, a
C₁₋₆ alkoxy group which may be substituted with 1 to 4
halogen atoms, a C₁₋₆ alkoxy-C₁₋₆ alkoxy group, a C₂₋₁₀
5 acyloxy group, a C₂₋₁₀ acyl group, a C₂₋₆ alkoxycarbonyl
group, a C₁₋₆ alkylthio group, a C₁₋₆ alkylsulfinyl group, a
C₁₋₆ alkylsulfonyl group, -NHC(=O)H, a C₂₋₁₀ acylamino group,
a C₁₋₆ alkylsulfonylamino group, a C₁₋₆ alkylamino group, an
N,N-di(C₁₋₆ alkyl)amino group, a carbamoyl group, an N-(C₁₋₆
10 alkyl)aminocarbonyl group, or an N,N-di(C₁₋₆
alkyl)aminocarbonyl group}; or

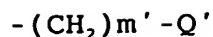
a C₃₋₇ cycloalkyl group, a C₃₋₇ cycloalkyloxy group,
an aryl group, a C₇₋₁₀ aralkyl group, an aryloxy group, a
C₇₋₁₀ aralkyloxy group, a C₇₋₁₀ aralkylamino group, a
15 heteroaryl group, or a 4- to 6-membered heterocycloalkyl
group, provided that each of these groups may be
substituted with 1 to 4 substituents selected from the
group consisting of a halogen atom, a hydroxyl group, a
C₁₋₆ alkyl group and a C₁₋₆ alkoxy group, and

20 R¹⁰, R¹¹, R¹², R¹³ and R¹⁴, which may be the same or
different, each represent:

a hydrogen atom;
a halogen atom;
a hydroxyl group;

25 a C₁₋₆ alkyl group which may be substituted with 1 to
4 substituents selected from the group consisting of a
halogen atom and a hydroxyl group;

a group represented by the formula:



{wherein m' represents an integer of 0 to 4 and Q' represents a formyl group, an amino group, a nitro group, a cyano group, a carboxyl group, a sulfonic acid group, a C₁₋₆ alkoxy group which may be substituted with 1 to 4 halogen atoms, a C₁₋₆ alkoxy-C₁₋₆ alkoxy group, a C₂₋₁₀ acyloxy group, a C₂₋₁₀ acyl group, a C₂₋₆ alkoxycarbonyl group, a C₁₋₆ alkylthio group, a C₁₋₆ alkylsulfinyl group, a C₁₋₆ alkylsulfonyl group, -NHC(=O)H, a C₂₋₁₀ acylamino group, a C₁₋₆ alkylsulfonylamino group, a C₁₋₆ alkylamino group, an N,N-di(C₁₋₆ alkyl)amino group, a carbamoyl group, an N-(C₁₋₆ alkyl)aminocarbonyl group, or an N,N-di(C₁₋₆ alkyl)aminocarbonyl group}; or

a C₃₋₇ cycloalkyl group, a C₃₋₇ cycloalkyloxy group, an aryl group, a C₇₋₁₀ aralkyl group, an aryloxy group, a C₇₋₁₀ aralkyloxy group, a C₇₋₁₀ aralkylamino group, a heteroaryl group, or a 4- to 6-membered heterocycloalkyl group, provided that each of these groups may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a C₁₋₆ alkyl group and a C₁₋₆ alkoxy group].

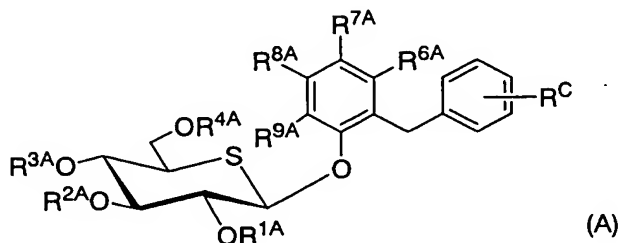
8. The 5-thio- β -D-glucopyranoside compound according to claim 7, wherein X is -CH₂-, or a pharmaceutically acceptable salt thereof or a hydrate thereof.

9. The 5-thio- β -D-glucopyranoside compound according to claim 7, wherein X is -O- or -NH-, or a pharmaceutically

acceptable salt thereof or a hydrate thereof.

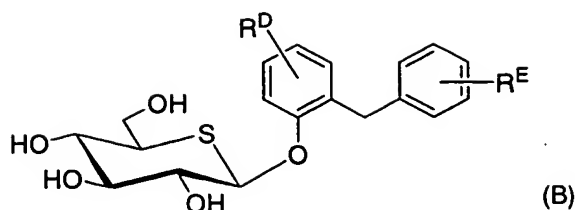
10. A 5-thio- β -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof:

5



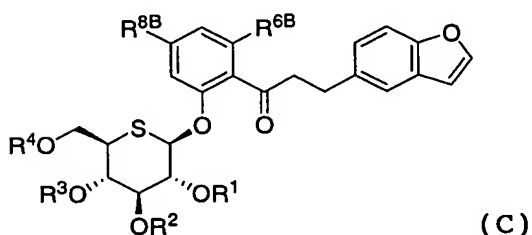
(wherein R^{6A} to R^{9A} , which may be the same or different, each represent a hydrogen atom, a halogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group, a C_{1-6} alkoxy- C_{1-6} alkoxy group, a carboxyl group, a C_{2-6} alkoxy carbonyl group, a hydroxyl group or a hydroxy- C_{1-4} alkyl group, R^C represents a hydrogen atom, a halogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group, a hydroxy- C_{1-4} alkyl group, a halogen-substituted C_{1-6} alkyl group or a C_{1-6} alkylthio group, R^{4A} represents a hydrogen atom, a C_{2-6} alkoxy carbonyl group or a C_{2-6} alkanoyl group, and R^{1A} to R^{3A} , which may be the same or different, each represent a hydrogen atom, a C_{2-6} alkanoyl group or a benzoyl group).

20 11. A 5-thio- β -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof:



(wherein R^D represents a hydrogen atom, a halogen atom, a C_{1-6} alkyl group or a hydroxy- C_{1-4} alkyl group, and R^E represents a hydrogen atom, a halogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group or a hydroxy- C_{1-4} alkyl group).

12. A 5-thio- β -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof or a hydrate thereof:



(wherein R^1 , R^2 , R^3 and R^4 , which may be the same or different, each represent a hydrogen atom, a C_{2-10} acyl group, a C_{7-10} aralkyl group, a C_{2-6} alkoxy carbonyl group, a C_{1-6} alkoxy- C_{2-10} acyl group or a C_{1-6} alkoxy- C_{2-6} alkoxy carbonyl group, R^{6B} represents a hydrogen atom, a halogen atom, a hydroxyl group, a C_{2-10} acyloxy group, or a C_{1-6} alkyl or C_{1-6} alkoxy group which may be substituted with 1 to 4 halogen atoms, and R^{8B} represents a hydrogen

atom, a halogen atom or a C₁₋₆ alkyl group which may be substituted with 1 to 4 halogen atoms).

13. A pharmaceutical preparation, which comprises the 5-
5 thio- β -D-glucopyranoside compound according to any one of
claims 1 to 12 or a pharmaceutically acceptable salt
thereof or a hydrate thereof as an active ingredient.

14. The pharmaceutical preparation according to claim 13,
10 which is an inhibitor of sodium-dependent glucose
transporter 2 activity.

15. The pharmaceutical preparation according to claim 14,
which is a prophylactic or therapeutic agent for diabetes,
15 diabetes-related diseases or diabetic complications.

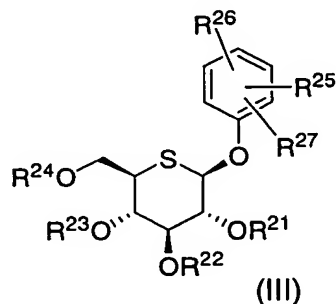
16. A pharmaceutical preparation, which comprises the
5-thio- β -D-glucopyranoside compound according to any one
of claims 1 to 12 or a pharmaceutically acceptable salt
20 thereof or a hydrate thereof, in combination with at least
one drug selected from the group consisting of an insulin
sensitizer selected from the group consisting of a PPAR γ
agonist; a PPAR α/γ agonist; a PPAR δ agonist; and a
PPAR $\alpha/\gamma/\delta$ agonist, a glycosidase inhibitor, a biguanide,
25 an insulin secretagogue, an insulin formulation and a
dipeptidyl peptidase IV inhibitor.

17. A pharmaceutical preparation, which comprises the

5-thio- β -D-glucopyranoside compound according to any one of claims 1 to 12 or a pharmaceutically acceptable salt thereof or a hydrate thereof, in combination with at least one drug selected from the group consisting of a
5 hydroxymethylglutaryl coenzyme A reductase inhibitor, a fibrate, a squalene synthase inhibitor, an acyl-coenzyme A:cholesterol acyltransferase inhibitor, a low-density lipoprotein receptor promoter, a microsomal triglyceride transfer protein inhibitor and an anorectic.

10

18. A 5-thio- β -D-glucopyranoside compound of the following formula or a pharmaceutically acceptable salt thereof or a hydrate thereof:



15

(wherein

R^{21} , R^{22} , R^{23} and R^{24} , which may be the same or different, each represent a hydrogen atom or a C_{2-10} acyl group,

20

R^{25} represents an amino group, a C_{2-6} alkanoyl group, a carboxyl group, a formyl group, a halogen atom, a C_{2-6} alkoxycarbonyl group or a hydroxyl group, and

R^{26} and R^{27} , which may be the same or different, each

represent a hydrogen atom, a halogen atom, a hydroxyl group, a C₁₋₆ alkyl group which may be substituted with 1 to 4 substituents selected from the group consisting of a halogen atom and a hydroxyl group, or a C₁₋₆ alkoxy group
5 which may be substituted with 1 to 4 halogen atoms).